

What is claimed is:

1 1. A method of fabricating a microfluidic device, comprising:
2 providing first and second substrate layers;

3 fabricating a microscale groove into at least a first surface of at least one of the first
4 and second layers, and concurrently fabricating an alignment structure into the at least one surface
5 of the first or second layers at a desired position relative to the microscale groove;

6 mating one or more of a third component of the microfluidic device and a tool with
7 the alignment structure to align the third component or the tool relative to the microscale groove.

1 2. The method of claim 1, wherein the first substrate comprises a silica-based
2 substrate and the alignment structure is etched into the first surface of the first substrate.

3 3. The method of claim 1, wherein the first substrate comprises a polymeric
4 substrate and the alignment structure is embossed onto the first surface of the first substrate.

5 4. The method of claim 1, wherein the first substrate comprises a polymeric
6 substrate and the alignment structure is injection molded onto the first surface of the first substrate.

7 5. The method of claim 1, wherein the alignment structure comprises a
8 depression on the first surface, and the tool comprises a drill.

1 6. The method of claim 1, wherein the third component comprises a capillary,
2 and the alignment structure comprises an aperture or well that is configured to receive the capillary
3 element.

1 7. The method of claim 25, wherein the alignment structure comprises a notch
2 at an edge of the first surface of the first substrate, the first groove terminating in the notch, the
3 notch being sized to receive the capillary element and such that a capillary channel disposed
4 through the capillary element is in fluid communication with the groove.

1 8. The method of claim 26, wherein the second substrate layer comprises a
2 second notch fabricated into a surface thereof at an edge of the surface of the second substrate layer,
3 the second notch being positioned to correspond with the notch in the first substrate when the first
4 and second substrates are mated together.

1 9. The method of claim 26, wherein the capillary element is inserted into an
2 aperture created by the notch in the first substrate and the notch in the second substrate when the
3 first and second substrates are mated, the capillary element operating as an alignment key during a
4 step of bonding the first and second substrates together.

1 10. A method of fabricating a multilayered microfluidic device, comprising:
2 providing a first notch in a first substrate layer;
3 providing a second notch in a second substrate layer, the first and second notches
4 being positioned to be complementary when the first and second substrate layers are mated
5 together;

6 inserting an alignment key into one of the first and second notches, the alignment
7 key being configured to fit into the first and second notches when the first and second substrate
8 layers are mated together, and align the first and second substrate layers in a first relative position;
9 and

10 mating and bonding the first substrate layer to the second substrate layer in the first
11 relative position.

1 11. The method of claim 10, wherein the first and second notches are disposed at
2 the edges of the first and second substrate layers, respectively.

1 12. The method of claim 11, wherein the one of the first and second substrates
2 comprises a groove fabricated into a surface thereof, the groove terminating in one of the first or
3 second notches, and wherein the alignment key comprises a capillary element.

1 13. The method of claim 12, wherein the capillary element comprises a
2 rectangular capillary having a capillary channel disposed therethrough.